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ABSTRACT

Included are three studies, each dealing with an aspect of comparative validity of the American College Test (ACT) and the Scholastic Aptitude Test (SAT) at selective colleges. The first study considered the predictive efficiency of the ACT test scores and ACT test scores plus high school grades at 120 colleges, separated into three groups according to average college ACT composite. The second study concerned four selective colleges where all students had taken both the ACT and the SAT. At all four of these colleges, the mean ACT Composite score was above 24.5; the mean SAT Total score was above 1200. The third study took place at the U.S. Air Force Academy, a highly selective institution. A focus of concern in this study was to correct for selection on one of the tests, in this case the SAT, by designing the study in such a way that prior selection of students by the SAT would not be an extraneous factor in the analysis of the comparative predictive validity of ACT and SAT. The evidence in the three studies points to the conclusion that ACT and SAT scores typically yield similar results at selective colleges, and where they do not the ACT is usually favored with higher correlation coefficients. (Author/BJG)

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PREDICTIVE VALIDITY OF THE ACT TESTS AT SELECTIVE COLLEGES

ABSTRACT

Three studies, each dealing with an aspect of comparative validity of ACT and SAT at selective colleges, are included. The first study considered the predictive efficiency of the ACT test scores and ACT test scores plus high school grades at 120 colleges, separated into three groups according to average college ACT Composite. Predictive efficiency was not found to vary appreciably at various points on the score scale. For 40 colleges where the mean ACT Composite was 24.5 or higher, the median multiple R using the ACT test scores was .46 and using the ACT test scores plus high school grades was .58. By contrast, at the 40 colleges where the mean ACT Composite was 15.5 to 20.0, the median multiple R using the ACT test scores was .46 and using the ACT test scores plus high school grades was .56. The difference is negligible. The median correlation of .58 using ACT test scores and high school grades at selective colleges compares favorably with .54 reported in CEEB materials as the median correlation using SAT test scores and high school rank at colleges defined by the same level of selectivity. Further, when the 40 colleges with the high mean ACT Composites are analyzed more closely, there is not a tendency for the predictive efficiency of ACT test scores and high school grades to decline as college mean ACT Composite goes up. The second study concerned four selective colleges where all students had taken both the ACT and the SAT. At all four of these colleges, the mean ACT Composite score was above 24.5; the mean SAT Total score was above 1200. In all four cases, the ACT test scores gave a better prediction of freshman overall Grade Point Average than did SAT. The median R with ACT was .407; with SAT, .316. The third study took place at the U.S. Air Force Academy, a highly selective institution. A focus of concern in this study was to correct for selection on one of the tests, in this case the SAT, by designing the study in such a way that prior selection of students by the SAT would not be an extraneous factor in the analysis of the comparative predictive validity of ACT and SAT. Using the conventional formulas for correction, the comparison of correlation coefficients again favored the ACT over the SAT, .56 to .52 for Sample 1, and .51 to .43 for Sample 2. Finally, when CEEB Achievement tests in English and mathematics were added to the two SAT scores in a multiple, the R obtained was comparable to or below that achieved by the ACT tests alone. The evidence in the three studies points to the conclusion that ACT and SAT scores typically yield similar results at selective colleges, and where they do not the ACT is usually favored with higher correlation coefficients.

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PREDICTIVE VALIDITY OF THE ACT TESTS AT SELECTIVE COLLEGES

Oscar T. Lenning[1]

When The American College Testing Program (ACT), with its college admissions and guidance battery, was introduced at the beginning of the last decade, some college educators were concerned about whether this new battery would predict freshman grades as well as older examinations such as the Scholastic Aptitude Tests (SAT). The consensus of studies published since that time, however, has been that the ACT Assessment predicts grades for typical college populations generally as effectively as or better than the SAT battery (Boyce & Paxson, 1965; Burns, 1964; Chase, et al., 1963a, 1963b, Lins, Abell, & Hutchins, 1966; Lenning & Maxey, 1972; Munday, 1965; Passons, 1967; Zimmerman & Michael, 1967). Furthermore, by 1971 more than 2,000 higher education institutions were participating in the ACT Program (The American College Testing Program, 1971, p. 3).

In spite of the general acceptance of the ACT Assessment, one question has not been answered to everyone's satisfaction. Although they would agree that ACT is as efficient a predictor as SAT for typical colleges, it has been the subjective contention of some that ACT should *not* predict as well as SAT for highly selective colleges having a preponderance of students with exceptional academic ability. There has been no objective evidence to support such a belief; rather it has been based on the fact that, unlike the SAT, the ACT was *not* specifically designed for use by highly selective colleges.

It was the purpose of this project to collect all available objective information bearing on the question of comparative predictive validity of the two tests at selective colleges. Three separate studies provide such data, and they are summarized here.

The first study presents correlations typically obtained with ACT data at colleges having quite different ability levels. This not only addresses the question as to whether validity varies appreciably at various points on the score scale, but also permits comparison with validity figures on the SAT reported by Angoff (1971). The second deals with four selective colleges where all students had taken both the ACT and SAT, and comparison of predictive validities was thus possible. The third is a case study of one selective institution, the U.S. Air Force Academy. In this study corrections were made for selection, so that this extraneous factor would not bear on the results.

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[1]The author gratefully acknowledges several people who helped with this report. First is Risdon J. Westen of the United States Air Force Academy, coauthor of the third study reported here. Second are Nancy S. Cole, Leo A. Munday, and E. James Maxey, all of the ACT Research and Development Division. Formerly a member of the ACT Research and Development staff, the author is now Senior Staff Associate with the National Center for Higher Education Management Systems/Western Interstate Commission on Higher Education.

Study 1: Predictive Efficiency of the ACT Tests at Selective Colleges

Samples and Design

Basic and Standard Research Service[2] records for the years 1970-72 were searched to identify colleges having an ACT Composite score mean of 24.5 or above. This score was chosen as a cut-off because it corresponds to a SAT Total score of 1,100, using the Chase and Barritt Table of Concordance (1966), and permits comparison of ACT data with the SAT data reported by Angoff (1971) for colleges with a SAT Verbal mean of 550 or higher.

Forty colleges having an ACT Composite mean score of 24.5 or above were found and included. For colleges participating more than once in the ACT predictive research services during those 3 years, their latest data were used for the study. The freshman student group sizes ranged from 98 to 4,976, with an average of 740. Because colleges participating in these research services are instructed to include either all or a representative sample of their freshman class, it was assumed that the groups were representative of the entering freshmen at those colleges.

Next, equal size samples of medium and low ability colleges were sought for comparison with the 40 high ability colleges. All colleges participating in the 1972 Basic and Standard Research Services were listed in ACT college code number order. A table of random numbers was used to select a starting point and the total number of colleges was divided by 39 to determine the number of colleges to skip each time before selecting a college. (This procedure in effect provides random selection within geographic strata because each state has a certain range of code numbers assigned to it.) If the college fell into the ACT Composite mean score range of 20.0 to 24.5, it was placed into the medium comparison group. If not, adjacent colleges in the ordered list were checked, alternating front and back, until a college falling into the proper score range was found. Then the proper number of colleges from the point of landing was skipped and another medium college selected in like manner. (Institutions such as nursing schools, business schools, and vocational schools were not included.) This process was carried on until a group of 40 colleges was selected.

The table of random numbers was used once again to select a new initial starting point. Identical procedures were then used to select a stratified random group of 40 colleges with ACT Composite means between 15.5 and 20.0.

Frequency tabulations of validity correlations for the three groups were prepared, and a median correlation was calculated for each group. This was done for ACT test scores as predictors (T-Index multiple correlations), and also for ACT test scores plus high school grades as predictors (TH-Index multiple correlations).

An additional procedure that involved only the high ACT Composite score group of colleges was used. Frequency tabulations of validity correlations were prepared separately for six different ACT Composite score mean levels. Once again, this was done for both T-Index and TH-Index multiple correlations.[3]

Results and Conclusions

The results of the study are presented in Tables 1 and 2. Table 1 presents validity correlation distributions and medians for the three groups of colleges. Considering the restricted range or greater homogeneity for the high ability colleges in comparison to the other two groups, the true predictive efficiency for the high ability group would seem to be comparable to that for the medium ability group and better than that for the lower ability group. Such a finding implies that the predictive validity of the ACT tests is as fully satisfactory for use at selective institutions as it is at more typical colleges and universities.

Angoff (1971) reports median multiple correlations of .52 for men and .56 for women at selective colleges using the two SAT scores plus high school rank as predictors. Based on ACT-SAT equivalency tables, Angoff's colleges and our 40 colleges with

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[2]The Basic Research Service and the Standard Research Service are two predictive research services offered each year by ACT. College officials can use reports provided by these services to analyze the predictive efficiency of ACT data for their campus, the grading practices on campus, and other factors.

[3]The TH-Index is actually not a multiple correlation. It is developed by obtaining grade predictions based on a multiple using the four tests and on another multiple using the four student-reported high school grades. The grade predictions are then averaged separately for each student. The result for each student is the TH-Index predicted grade. To obtain the TH-Index multiple correlation, the TH-Index predicted grades are correlated against the actual grades received by the students.

TABLE 1

ACT Test Multiple Correlations with Overall GPA for Colleges in Three Separate Ability-Mean Ranges

Validity Correlation Interval	Validity Frequencies					
	ACT Composite Mean 15.5-20.0		*ACT Composite Mean 20.0-24.5*		*ACT Composite Mean 24.5 +*	
	T-Index	TH-Index	T-Index	TH-Index	T-Index	TH-Index
65	1	7	3	17	1	6
60-64	2	6	3	8	0	8
55-59	3	10	5	5	5	15
50-54	5	8	10	3	5	8
45-49	12	0	8	2	14	1
40-44	5	4	5	4	10	2
35-39	5	2	1	1	3	0
30-34	3	2	4	0	1	0
25-29	3	1	1	0	1	0
15-24	1	—	0	—	0	—
Median R T-Index	46		50		46	
Median R TH-Index		56		53		58
Number of Colleges	40	40	40	40	40	40

Note. The top group includes all colleges participating in the ACT predictive research services that had an ACT Composite mean for their students of 24.5 or above. Like numbers of colleges with ACT Composite means in the other two ranges were selected at random as based on their 1971-72 freshmen.

mean ACT Composite scores above 24.5 represent the same level of selectivity. The midpoint for Angoff's correlations is .54, which could be considered as the index of SAT predictive accuracy at selective colleges. In contrast, the median multiple correlation for the ACT TH-Index is .58 for similarly defined selective colleges (see Table 2).

The difference between correlations of .58 and .54 is small. And, the two groups of colleges may not be as comparable as one would think. The ACT-SAT equivalency procedure used in this study to determine what ACT score would correspond to a SAT Verbal of 550, is not precise. It may also very well be that there are some basic differences in characteristics between the ACT selective colleges and the SAT selective colleges which could cause one group to be more predictable on grades than the other group. On the other hand, if such biases do exist, they could just as easily favor SAT as ACT. Therefore, even though the data suggest that ACT prediction compares favorably with SAT prediction at selective colleges (with any difference favoring ACT), we must wait for predictive studies using the two tests on the same students for a definite conclusion.

Table 2 presents validity correlation distributions and medians for specific ACT Composite mean ranges for the high group of colleges. The numbers of colleges in the various cells are too small to draw definitive conclusions, but there *does not seem* to be substantial interaction between predictability and ACT Composite mean score level.

TABLE 2

ACT Test Multiple Correlations with Overall GPA at 40 High Ability Colleges according to ACT Composite Mean Level

Validity Correlation Interval	Total Group Validity Frequencies		ACT Composite Mean 24.5-24.9		ACT Composite Mean 25.0-25.4		ACT Composite Mean 25.5-25.9		ACT Composite Mean 26.0-26.4		ACT Composite Mean 26.5-26.9		ACT Composite Mean 27.0 +	
	T-Index	*TH-Index*	*T-Index*	*TH-Index*	*T-Index*	*TH-Index*	*T-Index*	*TH-Index*	*T-Index*	*TH-Index*	*T-Index*	*TH-Index*	*T-Index*	*TH-Index*
65-69	1	6	1	2	0	2	0	0	0	1	0	1	0	0
60-64	0	8	0	3	0	3	0	0	0	1	0	0	0	1
55-59	5	15	2	6	3	5	0	3	0	0	0	0	0	1
50-54	5	8	2	3	0	2	0	1	1	1	1	1	1	0
45-49	14	1	4	0	6	0	1	0	1	0	1	0	1	1
40-44	10	2	4	0	2	0	2	0	1	2	0	0	1	0
35-39	3	—	1	—	1	—	1	—	0	—	0	—	0	—
30-34	1	—	0	—	0	—	0	—	1	—	0	—	0	—
25-29	1	—	0	—	0	—	0	—	1	—	0	—	0	—
Median R T-Index	46		47		47		42		42		50		47	
Median R TH-Index		58		58		59		46		52		60		70
No. of Colleges	40	40	14	14	12	12	4	4	5	5	2	2	3	3

Study 2: Validity Comparison of ACT and SAT on Same Students at Selective Colleges

Data in a study previously published by Lenning and Maxey (1973) suggest that the ACT battery can predict grades at selective colleges at least as well as the SAT battery. All of the ACT Standard Research Service records for the 3 years from 1969 through 1972 were searched, and 17 colleges that had included SAT scores as Local Predictors in their studies were found. For these institutions, ACT and SAT data were available for the same students. It was found that ACT had decidedly better prediction than SAT at over half of the colleges, but that SAT was a definitely better predictor at only one of the colleges.

Four of the 17 colleges happened to be selective institutions (ACT Composite mean scores above 24.5 and SAT-Total means above 1200); all students in each college had taken both ACT and SAT. As shown by the multiple correlations given in the two right-hand columns of Table 3, in all four cases, ACT gave better prediction of freshman overall GPA than SAT.

Some of the colleges used different tests for selection. Colleges A and B used ACT, College C used SAT, and College D used ACT and SAT (whichever the student took first). This is pertinent because the test used for selection will generally yield a lower correlation with a criterion than another equally good predictor available (Gulliksen, 1950). For this reason the overall results in Table 3 are conservative, because if formulas for prior selection were applied, the disparity between the median ACT and SAT Rs would increase.

TABLE 3

Validity Comparison of ACT and SAT

	N	ACT Composite Mean	SAT Total Mean	R_{ACT}	R_{SAT}
College A	619	27.4	1250	.421	.307
College B	116	26.1	1263	.325	.257
College C	299	25.8	1212	.392	.325
College D	1,159	24.6	1206	.473	.410
Median				.407	.316

The only conclusion one can draw from this evidence is that when the same students at selective colleges are tested with both ACT and SAT, ACT is at least as efficient a predictor as SAT and generally is better. Of course, we must remember that only four selective colleges were studied, and that they may or may *not* be representative of selective colleges in general. However, for these four colleges, the difference favoring ACT was quite large.

Study 3: Validity Comparison of ACT and SAT on Same Students at a Selective Institution with Corrections Made for Selection[4]

Samples and Procedures

The study took place at the U.S. Air Force Academy. Two different samples were used for the study; the second served as a replication sample. SAT had been required of all entering cadets, but some had also taken the ACT Assessment. A search was made of the ACT Assessment Program files to determine which of the freshmen in 1967-68 and 1968-69 had taken both batteries. Student Sample 1 for the study consisted of the 1967-68 Air Force Academy freshmen who had taken both the ACT and SAT (n = 271); Sample 2 included the 1968-69 freshmen who had taken both ACT and SAT (n = 348). Sample 1 had an ACT Composite mean of 27.7 and a SAT Total mean of 1250; Sample 2 had an ACT Composite mean of 27.2 and a SAT Total mean of 1249. As an indication of how academically able these groups were, one should keep in mind that national norms for enrolled freshman men have a Composite mean of 20.4 for ACT (The American College Testing Program, 1971, p. 67) and a Total mean of 949 for SAT (Angoff, 1971, p. 83).

[4]This study was originally published as "Prediction at a Highly Selective Institution after Corrections Have Been Made for Selection: ACT versus SAT" by R. J. Westen and O. T. Lenning, *College and University*, 1973, **49**, 68-76. With slight revision, it appears here by permission of the journal editor.

End of freshman year overall GPA was the criterion for the study. Pearson product-moment correlation coefficients (r) were calculated between overall GPA and scores on each battery subtest. In addition, stepwise multiple-regression analyses were conducted and multiple correlations (R) computed. For each battery, the computer program initially entered that predictor variable having the maximum zero-order correlation with the criterion. At each succeeding step, the variable was added which produced the greatest reduction in the error or residual sum of squares or, alternatively, which produced the maximum increase in R^2.

Because of the selective entrance requirements, it was assumed that the observed correlations with GPA would not give good estimates of the predictive efficiency of the two batteries. Increased homogeneity results in lower than normal correlations which underestimate the predictive efficiency. This result might be expected for ACT as well as for SAT (even though SAT was used in selection), considering the high correlation typically found between SAT Total and ACT Composite. Therefore, all the predictor correlations with GPA were corrected for homogeneity using the correction formulas for multivariate selection outlined by Gulliksen (1950, pp. 158-166). (Also see Lord and Novick, 1968, pp. 146-148.) As Gulliksen noted (1950, p. 158), the equations for multivariate selection become "almost prohibitively complex" unless matrix algebra is used, so matrix notation will be used in the remainder of this section.

Although selection to the Air Force Academy is also based on a number of other variables (e.g., physical aptitude, athletic activities index, nonathletic activities index), only two explicit-selection variables were of concern for this study: (a) SAT Verbal plus CEEB English Achievement and (b) SAT Quantitative plus CEEB Mathematics Achievement. Three incidental-selection variables were of concern for correcting the SAT correlations with GPA (SAT Verbal, SAT Quantitative, and College Freshman Overall GPA); and five were of concern for correcting the ACT correlations with GPA (ACT English, ACT Mathematics, ACT Social Studies, ACT Natural Sciences, and College Freshman Overall GPA). Incidental-selection variables are those variables of concern for which there is not a specific cutoff score but for which one would expect homogeneity to be affected because of their sizable correlations with the explicit-selection variables.

If X represents the explicit-selection variables and Y represents the incidental-selection variables and if upper case letters refer to the applicant group while lower case letters refer to the selected group of students, the multivariate-selection equation is:

$$C_{YY} = c_{yy} + c'_{yx}c^{-1}_{xx}C_{XX}c^{-1}_{xx}c_{xy} - c'_{yx}c^{-1}_{xx}c_{xy}$$

where:

C_{XX} and c_{xx} are the variance-covariance matrices for the explicit-selection variables, and C_{YY} and c_{yy} are the variance-covariance matrices for the incidental-selection variables.

Standard deviations and intercorrelations for all explicit and incidental variables were calculated. The variances and covariances were, in turn, computed from these and substituted into the above equation, and the equation was solved. This equation was solved separately for each set of incidental variables and for both student samples under study. The corrected correlations between the predictors and the overall GPA were contained in the resulting C_{yy} matrix. These correlations were then squared and multiplied by 100 to give the percentages of criterion (overall GPA) variance accounted for by the predictors.

Results

Intercorrelations, means, and standard deviations for the two study groups are shown in Table 4. Incidental-variable data were available only for 1968-69 applicants. Since it was known that the academy's applicant group varies little on these variables from year to year, these data were used for making calculations for both of the study groups. The zero-order correlation between the two explicit-selection variables for the applicant group (a large part of which was not selected for admission) was .6. The explicit-variable means and standard deviations for the applicant group were as follows:

	Mean	S.D.
SAT Verbal plus CEEB English Achievement	1065.7	165.3
SAT Quantitative plus CEEB Mathematics Achievement	1215.4	169.9

One should note how able and homogeneous the two student groups were, in comparison to the applicant group.

Table 4 shows that three of the four Student Sample 1 ACT subtest correlations with GPA are appreciably larger than both SAT subtest correlations with GPA. For Student Sample 2, all four ACT correlations with GPA are larger than both

TABLE 4

Intercorrelations, Means, and Standard Deviations for the Two Groups of Cadets

(Student Sample 1 values are above the diagonal and Student Sample 2 values are below the diagonal)

Variable	1	2	3	4	5	6	7	8	9	Student Sample 1 Means	Student Sample 1 S.D.'s
1 SAT-V + CEEB Eng. Ach.		34	88	33	51	23	51	36	27	1160.4	114.7
2 SAT-Q + CEEB Math. Ach.	32		29	91	22	50	16	26	35	1341.5	119.7
3 SAT Verbal	87	29		30	41	27	53	43	28	580.0	66.6
4 SAT Quantitative	31	88			24	51	17	27	29	670.4	60.3
5 ACT English	52	19	3			29	41	35	24	23.9	2.6
6 ACT Mathematics	21	50	19				35	51	39	30.2	3.0
7 ACT Social Studies	42	06	46	12	42	24		57	33	27.2	3.2
8 ACT Natural Sciences	39	22	43	24	38	33	52		32	28.8	3.3
9 College Overall GPA	16	29	20	22	24	33	28	30		2.7	0.6
Student Sample 2 Means	1166.6	1321.5	587.6	661.3	23.2	29.5	27.0	28.6	2.7		
Student Sample 2 S.D.'s	112.9	110.3	61.4	54.4	2.8	3.0	3.5	3.6	0.6		

Note. The correlations have been rounded to the nearest hundredth and the decimal points deleted.

SAT correlations with GPA. These results would be expected to change after corrections for selection have been made.

Table 5 gives the observed correlations with GPA, the corrected correlations with GPA, and the adjusted percentage of variance accounted for by each predictor. The ACT data accounted for more of the overall GPA variance than did the SAT data for both student samples: 31.8% versus 27.4% for Student Sample 1, and 26.1% versus 18.4% for Student Sample 2. Persons more interested in predictive correlations should note that the corrected multiple Rs for SAT are .523 and .429, while those for ACT are .564 and .511 for Student Sample 1 and Student Sample 2, respectively.

Also of interest to Air Force Academy officials was how much the CEEB English Achievement and Mathematics Achievement Test scores added to the prediction obtained with only the SAT scores. Officials felt that the additional half day of testing for each student should add appreciably to the predictive efficiency of the SAT scores alone.

Table 6 gives observed correlations with GPA, corrected correlations with GPA, and the adjusted percentage of variance accounted for when the CEEB Achievement scores were added as predictors along with the SAT scores. The addition of CEEB Achievement scores for Student Sample 1 brought the corrected multiple R almost up to the corrected R obtained with the ACT tests. For Student Sample 2, however, the corrected SAT correlation after the achievement tests had been added as predictors was still appreciably below that for the ACT tests.

Discussion

The results suggest that ACT scores can be at least as predictive, and likely more predictive, of grades at highly selective institutions than SAT scores. This conclusion seems even more evident when one considers that data at colleges reported in Munday's study (1965) suggested the possibility

TABLE 5

Observed Correlations with Overall GPA, Corrected Correlations with Overall GPA, and Percentage of the Criterion Variance Accounted for

Predictor Variable	Observed Correlation with GPA (R_o)	Corrected Correlation with GPA (R_c)	% of GPA Variance Accounted for (R_{c^2})	Predictor Variable	Observed Correlation with GPA (R_o)	Corrected Correlation with GPA (R_c)	% of GPA Variance Accounted for (R_{c^2})
Student Sample 1 (N = 271)[a]							
SAT Verbal	.282	.452	20.4	ACT English	.237	.380	14.4
				ACT Mathematics	.387	.503	25.3
SAT Quantitative	.288	.469	22.0	ACT Social Studies	.326	.441	19.4
				ACT Natural Sciences	.321	.436	19.0
SAT Multiple Regression Analysis	.354	.523	27.4	ACT Multiple Regression Analysis	.444	.564	31.8
Student Sample 2 (N = 348)[a]							
SAT Verbal	.201	.353	12.5	ACT English	.241	.357	12.7
				ACT Mathematics	.327	.444	19.7
SAT Quantitative	.223	.398	15.8	ACT Social Studies	.277	.349	12.2
				ACT Natural Sciences	.302	.401	16.1
SAT Multiple Regression Analysis	.265	.429	18.4	ACT Multiple Regression Analysis	.408	.511	26.1

[a] As indicated in the "Samples and Procedures" section of this study Sample 1 includes all 1967-68 Air Force Academy freshmen who had taken both ACT and SAT for admissions purposes, while Sample 2 includes all 1968-69 Air Force Academy freshmen who had taken both ACT and SAT for admissions purposes.

TABLE 6

Observed Correlations with Overall GPA, Corrected Correlations with Overall GPA, and Percentage of the Criterion Variance Accounted for When CEEB Achievement Tests Are Added to SAT

Predictor Variable	Observed Correlation with GPA (R_O)	Corrected Correlation with GPA (R_C)	% of GPA Variance Accounted for (R_C^2)	Predictor Variable	Observed Correlation with GPA (R_O)	Corrected Correlation with GPA (R_C)	% of GPA Variance Accounted for (R_C^2)
Student Sample 1							
CEEB English Ach.	.186	.388	15.1				
CEEB Mathematics Ach.	.346	.507	25.7				
SAT Multiple Regression Analysis	.354	.523	27.4				
SAT + CEEB Ach. Tests Multiple Regression Analysis	.404	.555	30.8	ACT Multiple Regression Analysis	.444	.564	31.8
Student Sample 2							
CEEB English Ach.	.089	.275	7.6				
CEEB Mathematics Ach.	.285	.438	19.2				
SAT Multiple Regression Analysis	.265	.429	18.4				
SAT + CEEB Ach. Tests Multiple Regression Analysis	.285	.466	21.7	ACT Multiple Regression Analysis	.408	.511	26.1

that ACT might more often predict better than SAT for women, and that this study involved only men. It should be remembered, however, that this study pertains only to one institution, an institution with a very specialized purpose. Whether the same results would occur at the more prevalent types of selective colleges and universities must be determined by similar research in those types of institutions.

Another important limitation of this study, one which also appears to be a problem of some of the studies cited, should be mentioned. ACT's experience has been that students who take both the ACT and the SAT tend to have characteristics different from those of students who take only the battery that is required. A sample could be selected at random, and those not submitting scores on the second battery could be tested on this battery on a residual basis so that the sample would be representative of the entire freshman class. Then, however, one would have the problem of a difference in motivation between the testing for the required battery and that for the battery not required for entrance. Testing at different times for different tests (e.g., long periods between the testing and testing occurring at different times of the day) may pose other potential problems. It would seem that an experimental design to overcome such problems is needed.

Conclusions from the Three Studies

Each of the studies reported here contains certain limitations, and applicable limitations have been noted in the discussions of each. However, the bulk of the evidence indicates that ACT and SAT are both valid predictors at selective as well as at more typical colleges. Where ACT and SAT do not yield similar results, ACT is usually favored with higher correlation coefficients. *While it is premature to say that ACT is generally more valid, it is fallacious to state that SAT is generally more valid.*

In conducting any on-campus study comparing ACT and SAT, selective institutions should heed the precautions pointed out in the three studies presented here. It is imperative that student motivation and other testing conditions be controlled for the two test batteries and that corrections be made for selection.

Because both ACT and SAT generally have adequate predictive validity, predictive validity differences between the two batteries perhaps should not be the factor determining which battery will be of most value. Selective institutions (as well as more typical colleges and universities) may judge which of the two testing programs to use on grounds other than relative predictive validity, such as college services provided by the testing agency, usefulness to students, and value in the admissions process.

REFERENCES

The American College Testing Program. *Using ACT on the campus* (1971-72 ed.). Iowa City, Iowa: Author, 1971.

Angoff, W. H. (Ed.). *The College Board Admissions Testing Program: A technical report on research and development activities relating to the Scholastic Aptitude Test and Achievement Tests.* New York: College Entrance Examination Board, 1971.

Boyce, R. W., & Paxson, R. C. The predictive validity of eleven tests at one state college. *Educational and Psychological Measurement,* 1965, **25,** 1143-1147.

Burns, R. L. An investigation of the value of The American College Testing Program, the Scholastic Aptitude Test and the Purdue Placement Tests as predictors of academic success of Purdue University freshmen. *Dissertation Abstracts,* 1964, **25,** 1476-1477.

Chase, C. I., & Barritt, L. S. A table of concordance between ACT and SAT. *Journal of College Student Personnel,* 1966, **7,** 105-108.

Chase, C. I., Ludlow, H. G., Pomeroy, M. C., & Barritt, L. S. *Predicting success for university freshmen.* Indiana Studies in Prediction No. 1. Bloomington: Indiana University, 1963. (a)

Chase, C. I., Ludlow, H. G., Pomeroy, M. C., & Barritt, L. S. *Predicting individual course success for entering freshmen.* Indiana Studies in Prediction No. 2. Bloomington: Indiana University, 1963. (b)

Gulliksen, H. *Theory of mental tests.* New York: Wiley, 1950.

Lenning, O. T., & Maxey, E. J. ACT versus SAT prediction for present-day colleges and students. *Educational and Psychological Measurement,* 1973, **33,** 397-406.

Lins, L. J., Abell, A. P., & Hutchins, H. C. Relative usefulness in predicting academic success of the ACT, the SAT, and some other variables. *Journal of Experimental Education,* 1966, **35**(2), 1-29.

Lord, F. M., & Novick, M. R. *Statistical theories of mental test scores.* Reading, Mass.: Addison-Wesley, 1968.

Munday, L. A. *Comparative predictive validities of the American College Tests and two other scholastic aptitude tests.* ACT Research Report No. 6. Iowa City, Iowa: The American College Testing Program, 1965.

Passons, W. R. Predictive validities of the ACT, SAT and high school grades for first semester GPA and freshman courses. *Educational and Psychological Measurement,* 1967, **27,** 1143-1144.

Westen, R. J., & Lenning, O. T. Prediction at a highly selective institution after corrections have been made for selection: ACT versus SAT. *College and University,* 1973, **49,** 68-76.

Zimmerman, W. S., & Michael, W. B. A comparison of the criterion-related validities of three college entrance examinations with different content emphases. *Educational and Psychological Measurement,* 1967, **27,** 407-412.

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